

Amax operates an underground potash mine and surface preparation mill located in Eddy County, New Mexico. The mine's ore is composed of potash and sodium chloride (salt) and contains seams of clay, mud, and carnallite.<sup>2/</sup> On June 19, 1984, Clyde E. Bays, an inspector of the Department of Labor's Mine Safety and Health Administration ("MSHA"), conducted an inspection of Amax's mine. In the shuttle car unloading area Inspector Bays observed an area of roof 15-feet by 8-feet in which a crack or separation was visible. Eight to ten roof bolts had been installed around the visible crack. Inspector Bays proceeded to sound the roof with his hammer. The inspector testified that when a solid roof is sounded a clear ringing sound is generally produced but that if there is "some separation in the strata" of the immediate roof a dull, "drummy" sound is heard. Tr. 27-28.<sup>3/</sup> When Inspector Bays sounded the area in question, he encountered a drummy, "dull thud" sound. Because of the presence of the visible crack and the results of his sounding test, the inspector believed that the roof was loose and inadequately supported and issued the subject citation alleging a violation of section 57.3-22. The inspector designated the alleged roof control violation as "significant and substantial." 30 U.S.C. § 814(d)(1).

The citation was terminated after Amax installed six additional roof bolts in the cited area. After installation of those bolts, Inspector Bays again tested the roof and found that it no longer sounded drummy.

At the hearing before Judge Melick, Amax's general mine superintendent, Robert Kirby, acknowledged that a drummy sound suggests that there is a separation at some point above the ceiling. He stated, however, that this does not necessarily mean that the material is loose and will fall. Kirby testified that the practice at Amax was to install roof bolts in drummy-sounding areas as insurance against roof falls. Kirby conceded on cross-examination that, despite his past experience in the mine, he is unable to determine with absolute certainty whether a drummy area will fall. S.K. Desai, Amax's production superintendent, testified that drummy-sounding roof is evidence of either a physical separation in the roof strata or loosened adhesion between the strata because of the presence of carnallite or mud seams. Desai testified that when carnallite comes in contact with salt it will produce a drummy sound when tapped. He further stated that the presence of carnallite poses the same hazard as separation in the seams and the material could fall.

<sup>2/</sup> Carnallite is a massive, granular, greasy, milk-white, soluble, hydrous magnesium-potassium chloride. Bureau of Mines, U.S. Department of Interior, A Dictionary of Mining, Mineral and Related Terms 177 (1968) ("DMMRT").

<sup>3/</sup> Drummy is defined as, "[l]oose coal or rock that produces a hollow, Toose, open, weak, or dangerous sound when tapped with any hard substance to test condition of strata; said especially of a mine roof." DMMRT 356.